

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Paul Teng (Reg. # 40,837) on 17 September 2009.

The application has been amended as follows:

In claim 19, line 1, **change** "A program" **to** "A computer-readable medium storing a computer-executable program".

In claim 20, line 1, **change** "The program" **to** "The computer-readable medium".

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Allowable Subject Matter

Claims 1-20 are allowed.

The following is an examiner's statement of reasons for allowance:

Independent claim 1 recites an image processing apparatus for quantizing multi-level (M-level) image data into N levels where M>N>1. The apparatus includes various means for performing operations such as quantization and error diffusion. The quantization threshold values are based on the multi-level value of the pixel being considered. At least one threshold value in an interval between two sequential quantized values for the N-level output data is calculated using the equation:

$$Th_{a+1} = \sqrt{\frac{(v - V_a)(V_{a+1} - V_a)}{2}} + V_a$$

where v is the input tone value and Va is the a-th quantization value for the N-level output data.

The apparatus recited in claim 1 is advantageous since it improves image quality and mitigates artifacts such as stripe-

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shaped pseudo-contours. While there is similar prior art, Examiner has not discovered the particular adaptive thresholding recited in claim 1. Similar prior art includes Shibaki (US-6,731,817), which describes an apparatus that converts M-level image data to N-level image data, wherein $M > N > 1$. However, Shibaki does not describe the particular adaptive thresholding recited in claim 1. Other related prior art includes Ishiguro (US-6,501,566) and Eschbach (US-5,268,774), both of which describe adaptive thresholding based on the input pixel value, but do not describe the particular adaptive thresholding recited in claim 1. Additional related prior art includes Kakutani (US-5,764,811), which adjusts threshold values based on both the input pixel value and the overall level of coding error. However, Kakutani does not describe the particular adaptive thresholding recited in claim 1. Similar prior art also includes Chang (US-6,707,576), which discloses adaptive halftoning through selectively adding noise prior to threshold quantization. However, Chang also does not teach the particular adaptive thresholding recited in claim 1.

Examiner has not discovered prior art which teaches each and every limitation of claim 1, either in a single reference or in an obvious combination of references. Therefore, claim 1 is deemed to be allowable.

Claims 2-6 each ultimately depend from claim 1, and are therefore also deemed to be allowable at least due to their respective dependencies from an allowable claim.

Independent claim 7 recites an image forming apparatus which contains the same allowable subject matter recited in claim 1. Therefore, claim 7 is deemed to be allowable for the reasons set forth for claim 1.

Claims 8-18 each ultimately depend from claim 7, and are therefore also deemed to be allowable at least due to their respective dependencies from an allowable claim.

Independent claim 19 recites a computer-readable medium storing a computer-executable program which performs the operations performed by the apparatus recited in claim 1. Claim 19 contains the same allowable subject matter found in claim 1. Therefore, claim 19 is deemed to be allowable for the reasons set forth for claim 1.

Claim 20 depends from claim 19, and is therefore also deemed to be allowable at least due to its dependency from an allowable claim.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A.

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Thompson whose telephone number is (571)272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward L. Coles can be reached on 571-272-7402. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/James A Thompson/
Primary Examiner
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25 September 2009